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TITLE

NATURAL DECLINE OF TUSSOCK MOTH INFESTATIONS IN THE INLAND EMPIRE

By Philip C. Johnson

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400,000 sprayed
in 1947

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NATURAL DECLINE OF TUSSOCK MOTH INFESTATIONS IN THE INLAND EMPIRE

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ABSTRACT

The Douglas fir tussock moth (Hemerocampa pseudotsugata McD.) is a forest pest which, at times, has caused serious damage to Douglas and grand fir forests in the Pacific Northwest. Its damage, caused by the caterpillars soon after the current season's growth appears, consists of partial or complete defoliation of a few or all the trees over relatively large areas. In 1946 an outbreak of this insect reached epidemic proportions in northern Idaho and in 1947 an area of nearly 400,000 acres was sprayed from the air with DDT in a successful effort to control it.

Additional outbreaks of the tussock moth were located during the summer of 1947 causing damage to Douglas fir on 10,000 acres near Colville, Washington and to grand fir on some 20,000 acres near Orofino, Idaho. Studies of each of these infestations were made to determine their extent and to determine if control would be necessary.

By the time the caterpillars had reached their final instars the incidence of parasitism had become so great, especially in the Orofino area, as to practically assure satisfactory natural control. The sudden effects of a polyhedral virus disease, however, combined with that of the parasites, effectively stopped all further development.

The caterpillar mortality was almost 100 percent. Since this occurred prior to pupation this action effectively halted the infestations in both areas.

NATURAL DECLINE OF TUSSOCK MOTH INFESTATIONS IN THE INLAND EMPIRE

by
PHILIP C. JOHNSON 1/

The Douglas fir tussock moth (Hemerocampa pseudotsugata McD.) is a forest pest which, at times, has caused serious damage to Douglas and grand fir forests in the Pacific Northwest. Its damage, caused by the caterpillars soon after the current season's growth appears, consists of partial or complete defoliation of a few or all the trees over relatively large areas. In 1946, a number of outbreaks in British Columbia, Washington, Idaho and Oregon reached epidemic proportions. The most serious of these, in north Idaho, was quelled when an oil mixture containing over 400,000 pounds of DDT was sprayed from airplanes over an equal number of acres of forest lands in one of the largest projects of its kind ever undertaken in the continental United States. This control program was undertaken by a number of private, State and Federal timberland owners and managers in a concerted action in what amounted to almost complete obliteration of the tussock moth infestation in this area.

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Soon after completion of this spraying program, in July, 1947, several new outbreaks of this insect were discovered outside the sprayed area near Orofino, Idaho, and Colville, Washington. These new outbreaks threatened additional timberlands owned by some of the participating agencies of the north Idaho spray program. Some of these, encouraged by the results of this program, urged that a study be made of the new outbreaks for the purpose of planning another control project in 1948 if necessary. Accordingly, a study of the Orofino and Colville outbreaks was begun in July, 1947, and continued until October by the Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture, the agency which acted as technical advisor in the 1947 spray program.

As the 1947 summer progressed these infestations were studied by the Bureau to record their development and to watch for any epidemic tendencies. By means of aerial reconnaissance and by intensive ground examinations the location and extent of each infestation center was determined and the amount of damage ascertained. Details of the development of the various stages of the tussock moth were obtained from periodic observations at key points as the season progressed. In addition, effects of parasites upon the moth infestations were studied from material reared at the Bureau's insect laboratory at Coeur d'Alene, Idaho. Information gleaned from these various activities has made it possible to determine the trend of the infestations and to evaluate their importance in the discussion which follows.

The Orofino outbreak covered approximately 20,000 acres of grand fir stands left as a result of pine cutting operations some years ago. In this area, which lies between the towns of Orofino, Headquarters and Weippe, the infestation was more or less spotty in a stand which was quite uniformly composed of large medium dense reproduction and poles.

Besides its choice of Douglas fir as a host the Colville infestation differed from the Orofino one in that it did not occur as uniformly over the infested area, but rather as a series of well-defined and distinctly separated centers. Furthermore, the Douglas fir stands were younger and much denser than the infested grand fir stands in the Orofino area. At least a dozen separate infestation centers, totalling about 10,000 acres, were located between the Columbia and Colville Rivers near the towns of Gifford, Rice, Addy, Colville and Kettle Falls.

It should be pointed out that the Orofino and Colville infestations cannot be compared to the north Idaho infestation which was treated by aerial spraying in June, 1947. Whereas the infestation in the latter area was highly epidemic resulting from several years' build-up, the Orofino and Colville outbreaks were in their initial stages. If visible damage is used as a criterion, it might be said that these outbreaks began early in the summer of 1947. Actually, however, the tussock moth population was building up in these areas in 1946 since numerous egg masses were laid in the fall of that year.

The question as to whether the outbreaks developed "in place", as seems to be the case at Colville, or by infiltration from nearby epidemic infestations, or both, as it appeared at Orofino, cannot be answered conclusively from the facts at hand.

Despite the fact that the new outbreaks at Orofino and Colville were in their incipient stages a heavy population of tussock moth caterpillars was produced from eggs which had been deposited in September, 1946. These eggs began hatching late in May of this year.

The caterpillars appeared to have developed normally and to have reached their full growth the latter part of July at Colville and early in August in the Orofino area. At this point, however, the caterpillars suddenly became sickly and bedraggled in appearance and began dying in great numbers. Many of their bodies were draped limply over twigs in grotesque fashion or hung in inanimate suspension on the trunks of the trees. Many caterpillars were clustered about the bases of infested trees, having dropped out of the trees either in preparation for pupation or because of their sickly condition.

Ailing caterpillars were collected and determined by Dr. Edward A. Steinhaus, Assistant Professor of Insect Pathology, University of California, to have succombed to polyhedrosus, a disease caused by a polyhedral virus.

So conclusive was the action of the disease that practically all the living caterpillars of the tussock moth were killed with dramatic suddenness. This was especially so in the Colville area. In the Orofino area the caterpillar mortality resulting from the disease was less, but still a potent factor in completely halting further development of the 1947 tussock moth broods.

The virus disease was not the sole factor in curbing the 1947 infestations in these two areas, however. Soon after the caterpillars began their growth it became evident that they were becoming parasitized in increasing numbers, particularly in the Orofino area. Caterpillars and pupae collected from both this and the Colville area were placed in rearing at the Coeur d'Alene Forest Insect Laboratory at intervals during July and August. Normally these could have been reared through to new adult moths with very little mortality. In contrast to this the reared material showed the following results:

Stage	Number Collected	Number of Adult Moths Produced	Mortality Per Cent
Caterpillars	695	57	91.8
Pupae	839	2	99.8

While the above mortality was due principally to a tachinad and several hymenopterous parasites, contamination by the virus disease undoubtedly accounted for some of the mortality. It is believed that the mortality from parasites alone, however, would have been great enough to have effectively stopped most of the tussock moth infestations by the time normal pupation would have occurred in August.

As a result of the combined action of the virus disease and parasites all development of the tussock moth infestations in the Colville and Orofino areas ceased the latter part of August. Very few pupae were formed and these were heavily parasitized. No adult moths were observed in the field and a concerted effort to locate new egg masses during September failed to reveal any.

It is doubtful if the 1947 tussock moth infestations in the Colville and Orofino areas resulted in any trees being defoliated beyond the point of recovery. Defoliation of grand fir in the Orofino area was light enough in many cases to escape casual notice. Damage to the Douglas fir in the Colville area seemed somewhat heavier resulting for the most part in more complete defoliation of the upper crowns. A slowing up of growth and some stem deformity will undoubtedly follow the defoliation. There should not be much danger of subsequent Douglas fir bark beetle attacks in the Colville area because of the young age of the defoliated trees.

The 1947 tussock moth infestations in the Colville and Orofino areas appear to have been completely wiped out in August due to the effects of the virus disease and parasites. The complete absence of 1947 egg masses in these two areas is reasonable assurance that the infestations have definitely been halted.